

THE GEORGE WASHINGTON UNIVERSITY
SCHOOL OF ENGINEERING
AND APPLIED SCIENCE
Harold Liebowitz, *Dean*

The George Washington University is a privately supported, nonsectarian university which was founded in 1821 and has earned national recognition for excellence in many fields.

The School of Engineering and Applied Science was established in 1884 and offers programs leading to Bachelor's, Master's, and Doctor's degrees. Accredited curricula are offered in civil, electrical, and mechanical engineering. Areas of concentration may be selected from aerospace engineering; communications; computer science; electrophysics (electronics, fields and waves); engineering administration; fluid mechanics; geotechnics and foundation engineering; mechanical engineering design; medical engineering; ocean and marine engineering; operations research; propulsion; solid mechanics and materials engineering; structural engineering; systems analysis; systems science, networks, and control; thermal sciences; transportation engineering; urban environmental engineering.

The School has well-equipped laboratories for Master's and Doctoral research. Arrangements with NASA-Langley Research Center, the National Bureau of Standards, and Naval Ship Research and Development Center permit use of their ultramodern laboratories for appropriate research projects.

CONTINUING ENGINEERING
EDUCATION PROGRAM
J.E. Mansfield, *Director*

The Continuing Engineering Education Program is a series of non-credit courses designed to enhance the competence of practicing engineers. The explosive growth of scientific and technological knowledge has made such programs necessary so that engineers and scientists can remain current in their fields. The courses are taught by instructors from industry, government, and universities who are in the forefront of their respective fields. The program is designed to update an engineering or science degree which may be a number of years old; to provide basic review courses; and to provide the very latest information in the engineering, scientific, and engineering administration fields. A by-product of the program has been the beneficial associations developed among the students and between students and the staff. Although most courses presume a bachelor's degree, nondegree engineers will find the courses understandable and useful.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

In accordance with the stated policy of its Board of Trustees and in conformity with federal laws and regulations, George Washington University does not discriminate against any person on the bases of sex, race, color, religion, or national origin in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 call for an explicit statement that the requirement not to discriminate on the basis of sex extends to employment in and admission to such programs and activities.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to the Office of the University's Coordinator of Equal Opportunity Programs or to the Director of the Office of Civil Rights of the Department of Health, Education and Welfare.

**STRUCTURED PROGRAMMING AND
SOFTWARE ENGINEERING**
June 6-10, 1977

registration form

Name _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

Company Phone _____ Home Phone _____

☐ Register me for course No. _____

☐ Payment Enclosed ☐ Bill Me ☐ Bill Office

☐ Please send information on courses numbered: _____

DETACH ENTIRE PANEL AND MAIL TO: Continuing Engineering Education, The George Washington University, Washington, D.C. 20052

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BOX 3
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Continuing Engineering Education
George Washington University
Washington, D.C. 20052

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SCHOOL OF ENGINEERING
AND APPLIED SCIENCE

CONTINUING ENGINEERING
EDUCATION PROGRAM

STRUCTURED PROGRAMMING AND SOFTWARE ENGINEERING

June 6-10, 1977

ROUTE TO: _____



THE
GEORGE WASHINGTON
UNIVERSITY

WASHINGTON, D.C. 20052
(202) 676-6106
(800) 424-9773

STRUCTURED PROGRAMMING AND SOFTWARE ENGINEERING

DESCRIPTION

This course is organized to provide a technical update for experienced program architects, designers, and managers who need to acquire a new level of completeness and precision in logical expression, analysis, and invention for performing and managing software architecture, design, and production. The presentation will cover principles and applications in structured programming and software engineering including stepwise refinement, program correctness, and topdown system development. The course will include design workshops with analysis and review sessions to provide actual practice in problem-solving design development. Although there is no prerequisite for this course, some experience in program design or program management would be helpful.

TOPICS

Monday

- 1) structured programming
 - the idea of structured programming
 - reading structured programs
 - writing structured programs

Tuesday

- 2) structured program design
 - stepwise refinement
 - program correctness
 - stepwise reorganization

Wednesday

- 3) topdown system development
 - segment structured programming
 - programming tools
 - integration, testing, and debugging

Thursday

- 4) software architecture
 - requirements and specifications
 - system configuration
 - system design languages

Friday

- 5) organization and management
 - chief programmer teams
 - egoless programming
 - programmer education

INSTRUCTORS

Victor R. Basili, Ph.D., is an associate professor at the University of Maryland at College Park. He has been actively involved in the design and development of several software projects including the SIMPL family of structured programming languages, the graph algorithmic language GRAAL, and the SL/1 language for the CDC STAR. Dr. Basili has acted as a consultant at the Institute for Computer Applications in Science and Engineering at NASA-Langley Research Center, the Naval Research Laboratories in Washington, D.C., and the Naval Systems Weapons Laboratory in Dahlgren, Virginia.

Harlan D. Mills, Ph.D., is a Fellow at the Federal Systems Division of IBM. He has been concerned with programming management and methodology, including the development of chief programmer teams and the introduction of structured programming methods on a corporate-wide basis. Dr. Mills also teaches computer science at the University of Maryland and Johns Hopkins University. Before joining IBM, he served on the technical staffs of GE and RCA, as president of Mathematica, and on the faculties of Iowa State, Princeton, and New York Universities.

FEE

The fee for the course is \$450. This includes lecture notes and supplies. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Free parking is provided. Participants may delay payment until arrival.

HOUSING AND MEALS

Housing and meals are not provided. However, there is a wide variety of hotels, motels, and restaurants nearby. Information on available accommodations will be sent if requested.

LOCATION AND HOURS

Orientation will be at 8:15 a.m. on the first day; classes will meet from 8:30 a.m. to 4:15 p.m. daily in room 641 of the University Library, 2130 H St., N.W. (corner of 22nd and H), Washington, D.C.

CERTIFICATE

Students attending the full course will receive a Certificate of Completion.

CONTINUING EDUCATION UNITS (CEU)

Continuing Education Units (3.0) will be awarded for the satisfactory completion of this course. The CEU is a uniform unit of measurement for recording substantive non-credit learning in qualified continuing education programs. It provides a standardized means for business, industry, and government to measure in-service education. A permanent transferable record is maintained.

APPLICATIONS

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SPECIAL COURSES

At a substantially lower per capita cost, an organization can arrange for presentation of certain courses to its members either on or off campus.

OTHER COURSES

(Dates subject to change)

IN WASHINGTON, D.C.	
No.	
241	Modern Data Communications (Apr 25-29)
167	Forecasting Techniques (Apr 25-29)
82	Metal Fracture & Fatigue (Apr 25-29)
298	Numerical Methods in Structural Mechanics (Apr 26-29)
439	Standards, Specifications, Codes and Technical Data (Apr 27-29)
224	Design-to-Cost (May 2-4)
446	Applied Statistical Theory (May 2-6)
322	Computer Security (May 4-6)
420	Life Cycle Costing (May 4-6)
397	Fibrous Composite Structures (May 9-12)
287	Environmental Law (May 9-13)
395	Digital Signal Processing (May 9-13)
336	Advances in Electronics Technology (May 9-13)
447	Engineering Management (May 9-13)
424	Application of Modular Microelectronics and Microprocessors (May 11-13)
414	Total Energy and Selective Energy Utility Systems (May 16-17)
203	Radar Systems and Technology (May 16-20)
394	Mathematical Theory of Reliability (Apr 16-20)
249	Electromagnetic Wave Propagation for Communications System Design (May 16-20)
445	Discrete Event Simulation (May 18-20)
448	Acquisition of Medical Devices for Non-federal Health Care Institutions (May 18-20)
415†	Practical Digital Design (May 21-Jul 9)
444	Loan Guarantee Program for Financing Energy Conservation Opportunities in Existing Buildings (May 23-25)
260	Digital Integrated Circuits (May 23-27)

†Saturday class

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 167 Forecasting Techniques (Apr 25-29)
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DETACH ENTIRE PANEL AND MAIL TO:

**APPLICATION OF MODULAR
MICROELECTRONICS AND MICROPROCESSORS**
 May 31-June 3, 1977

registration form

Name _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

Company Phone _____ Home Phone _____

☐ Register me for course No. _____

☐ Payment Enclosed ☐ Bill Me ☐ Bill Office

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SCHOOL OF ENGINEERING
AND APPLIED SCIENCE

CONTINUING ENGINEERING
EDUCATION PROGRAM

APPLICATION of MODULAR MICROELECTRONICS and MICROPROCESSORS

May 31-June 3, 1977

ROUTE TO:



THE
GEORGE WASHINGTON
UNIVERSITY

WASHINGTON, D.C. 20052
 (202) 676-6106
 (800) 424-9773

APPLICATION OF MODULAR MICROELECTRONICS AND MICROPROCESSORS

DESCRIPTION

This course is designed to meet practical needs of systems and application engineers and supervisory-level engineers who are involved with the application of modular microelectronics and microprocessors.

The objective of this course is to provide practical state-of-the-art techniques utilizing microelectronic devices and microprocessors in a modular fashion.

Course participants will gain a knowledge of the latest characteristics and costs of microelectronic devices, the architecture and design of modular microcomputers, and specific applications in telecommunications, data processing, and signal processing.

Although there is no prerequisite for this course, a degree in engineering or computer science would be helpful.

TOPICAL OUTLINE

First Day

Modular Microelectronics

- State of the art: integrated circuit technology
- Logic families and SSI
- Medium-scale integrated circuits, MSI, registers, counters, multiplexors, decoders, PLAs
- Read-Only memories; mask, prom, and E-Rom
- Random-access memories, static and dynamic Rams
- Other memory chips, CAMS, FIFO's, CCD's.

Second Day

Modular Microprocessors/Microcomputers Design

- I/O methods and I/O interfacing
- Microprocessor architecture
- Microcomputer design
- Sequential logic control vs. microprogram control
- Bit-slice microprocessor
- Signal processing application

Third Day

Microprocessors/Microcomputers

- Currently available microprocessors and microcomputers
- Hardware/software trade-offs
- Description of hardware architecture, programming languages and comparisons of some micro-

computers: Intel 8080, M 6800, IMP 16, TI SBP 0400, Rockwell PPS 8

Fourth Day

Applications of Microprocessors in Telecommunications

- Definition, classes, and applications of distributed processing
- Communication concepts for distributed processing systems; circuits, mediums, protocols, front end computers
- Communication networks; data communication, ring networks
- Case Study; trade-off in using microcomputers vs. large computers

INSTRUCTORS

Abd-elfattah M. Abd-alla, Ph.D., is Associate Professor of Engineering and Applied Science at GWU. Dr. Abd-alla received an M.S. in electrical engineering from Alexandria University, Egypt, in 1963, and a Ph.D. in computer science from the University of Maryland in 1969. He is the author of a number of publications on computer architecture and design, and is co-author, with Arnold C. Meltzer, of *Principles of Digital Computer Design* Vol. I. (Vol. II is in preparation). He has been a consultant on the design of computer systems to government agencies.

John H. Carson is a member of the technical staff of the MITRE Corporation. His present work deals with the study and design of special purpose minicomputer systems. His past experience includes work in conjunction with Lehigh University and Bell Telephone Laboratories dealing with the development of minicomputer controlled test equipment. He is also a Lecturer for the American University in the Center for Technology and Administration.

Terry L. Collins is an electronic engineer in the Communication Sciences Division at the Naval Research Lab. He has done extensive work in design of signal processors with hands-on experience in microprocessors and minicomputers. He earned his Ph.D. in Computer Science from the George Washington University in 1976.

FEE

The fee for the course is \$425. This includes lecture notes and supplies. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Free parking is provided. Participants may delay payment until arrival.

HOUSING AND MEALS

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SPECIAL COURSES

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OTHER COURSES

(Dates subject to change)

No.

IN WASHINGTON, D.C.

- 330 Computerized Antenna Analysis (Apr 11-15)
- 435 Telecommunications (Apr 11-15)
- 310 Microprocessors (Apr 13-15)
- 339 Energy Conservation: Opportunities and Guidelines for Existing Buildings (Apr 25-27)
- 426 ECM and ECCM for Digital Communications (Apr 18-22)
- 338 OSHA for Government (Apr 20-22)
- 244B† Temperature Control Systems for Heating and Air Conditioning: Basics of Design (Apr 23-Jun 18)

Apr 97

SCHOOL OF ENGINEERING
AND APPLIED SCIENCE

CONTINUING ENGINEERING
EDUCATION PROGRAM

MICROPROCESSORS

July 20-22, 1977

ROUTE TO: _____



THE
GEORGE WASHINGTON
UNIVERSITY

WASHINGTON, D.C. 20052
(202) 676-6106
(800) 424-9773

MICROPROCESSORS #310

July 20-22, 1977

registration form

Name _____

Title _____

Organization _____

Address _____

City _____

State _____

Zip _____

Company Phone _____

Home Phone _____

☐ Register me for course No. _____

☐ Payment Enclosed ☐ Bill Me ☐ Bill Office

☐ Please send information on courses numbered: _____

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- 448 Acquisition of Medical Devices for Non-federal Health Care Institutions (May 18-20)
- 415† Practical Digital Design (Jun 4-Jul 16)
- 444 Loan Guarantee Program for Financing Energy Conservation Opportunities in Existing Buildings (May 23-25)
- 260 Digital Integrated Circuits (May 23-27)
- 349 Design and Prediction of Sonar Systems (May 23-27)
- 382 Transmission Characteristics of Switched Telephone Networks (May 23-27)
- 22 Working Statistics (Jun 1-3)
- 406 Computer-aided Preliminary Ship Design (Aug 29-Sep 2)
- 307 Digital Image Processing of Earth Observation Sensor Data (Jun 6-10)
- 252 Electromagnetic Compatibility (Jun 6-10)
- 360 Communication Systems Engineering (Jun 6-10)
- 374 Structured Programming (Jun 6-10)
- 247 Technology Trends in Communications (Jun 6-10)
- 151 Heat Pipe - Theory and Applications (Jun 7-10)
- 416 Integrated Energy Utility Systems (Jun 13-14)
- 428 Antennas (Jun 13-17)
- 355 Patent Law for Engineers and Scientists (Jun 16-18)

†Saturday classes

IN MIAMI, FLORIDA

- 407M Automated Document Storage and Retrieval Systems (Dec 6-8)
- 302M Spread Spectrum Communication Systems (Dec 6-10)
- 236M Configuration Management of Software Systems (Dec 8-10)
- 396M Statistical Techniques for Use in Biomedical Studies (Dec 13-15)
- 388M Software Design for Data Communication Systems (Dec 13-17)
- 424M Application of Modular Microelectronics and Microprocessors (Dec 14-16)
- 167M Forecasting Techniques (Jan 17-19)
- 112M Configuration Management (Jan 19-21)
- 224M Design-to-Cost (Jan 24-26)
- 409M Airborne Microwave and Millimeter Radar (Jan 24-28)
- 382M Switched Telephone Networks (Jan 24-28)
- 355M Patent Law for Engineers and Scientists (Jan 31-Feb 2)
- 345M Standards and Specifications (Feb 1-3)
- 374M Structured Programming Software Engineering (Feb 7-11)
- 322M Computer Security (Feb 8-10)
- 391M Distributed Processing Concepts and Techniques (Feb 8-11)
- 376M Analysis and Prevention of Material Failure (Feb 14-18)
- 420M Life Cycle Costing (Feb 15-17)
- 278M Intensive and Coronary Care Units (Feb 16-18)

IN TIDEWATER, VIRGINIA

- 310T Microprocessors (Jan 19-21)
- 252T Electromagnetic Compatibility (Jan 24-28)
- 224T Design-to-Cost (Feb 1-3)

IN SAN DIEGO, CALIFORNIA

- 203S Radar Systems (Jan 17-21)
- 349S Design and Prediction of Sonar Systems (Feb 28-Mar 4)

*Night Course

†Saturday Course

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MICROPROCESSORS**DESCRIPTION**

This course is designed for engineers, managers, and others who are currently using or planning to use microprocessors. The course will provide a clear understanding of the principles of microprocessor hardware structure, architecture, and software, and an appreciation of the capabilities and the limitations of the microprocessor. Two specific microprocessors, the IMP-16 and the M6800, will be discussed in depth. Through the detailed study of these machines, the participant should acquire a working knowledge of basic microprocessor terminology, concepts, and potential applications. Those attending will be afforded an opportunity to participate in writing simple benchmark programs for the IMP-16 and M6800 microprocessors. The course should be of interest to those working both inside and outside of the computer field. No extensive knowledge of electrical or computer engineering is required, although a basic knowledge of at least one programming language would be helpful.

COURSE OUTLINE & SCHEDULE*First Day***General Microprocessor Hardware/Software Concepts**

- Introduction to microprocessors
- Microprocessor structure and information representation
- Microprocessor instructions and interpretation processes
- Input/output hardware communication
- Program code syntax, sequencing, and structure
- Processor environment, recursion, and stacks
- Subroutine linkage and calling sequence
- Input/output concepts: interrupts, priority, and service
- Microprocessor software support

*Second Day***Study of the IMP-16 Microprocessor**

- General specifications and functional description of IMP-16C
- IMP-16 operation and control
- Data representation and addressing
- Instruction set description
- Input/output operation
- Programming session and discussion

*Third Day***Study of the M6800 Microprocessor**

- General specifications and functional description of the M6800
- M6800 operation and control
- Data representation and addressing
- Instruction set description
- Input/output operation
- Programming session and discussion
- Evaluation of microprocessors

INSTRUCTOR

Keith L. Doty — Dr. Doty received a B.S. in 1964 and an M.S. in 1965 from M.I.T., and a Ph.D. in 1967 from the University of California at Berkeley. Since 1968 he has been a member of the Department of Electrical Engineering at the University of Florida. He has published over 15 technical papers in the areas of systems theory, switching theory, and minicomputers. Since 1970 he has frequently worked as a consultant in minicomputer and microcomputer systems design. He is currently active in microprocessor research; his principal interests relate to the interaction between hardware and software in computer system design.

FEE

The fee for the course is \$390. This includes lecture notes and supplies. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Participants may delay payment until arrival. Parking is provided.

HOUSING AND MEALS

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- 446 Applied Statistical Theory (May 2-6)
- 322 Computer Security (May 4-6)
- 420 Life Cycle Costing (May 4-6)
- 397 Fibrous Composite Structures (May 9-12)
- 287 Environmental Law (May 9-13)
- 395 Digital Signal Processing (May 9-13)
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- 424 Application of Modular Microelectronics and Microprocessors (May 30-Jun 3)
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- 394 Mathematical Theory of Reliability (May 16-20)
- 249 Electromagnetic Wave Propagation for Communications System Design (May 16-20)
- 445 Discrete Event Simulation (May 18-20)

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(Dates Subject to Change)

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| 374 | Structured Programming (Jun 6-10) |
| 247 | Technology Trends in Communications (Jun 6-10) |
| 151 | Heat Pipe-Theory and Applications (Jun 7-10) |
| 416 | Integrated Energy Utility Systems (Jun 13-14) |
| 428 | Antennas (Jun 13-17) |
| 309 | Microprogramming (Jun 20-23) |
| 387 | Microprocessors and Microcomputers (Jun 20-24) |
| 418 | Minicomputer Systems for Warehousing/Distribution Operations (Jun 22-24) |
| 250† | Electric Power System Design (Jun 25-Sep 24) |
| 292 | Modern Telecommunications (Jun 27-Jul 1) |
| 302 | Spread Spectrum Communications Systems (Jun 27-Jul 1) |
| 356 | Microwave Remote Sensing of Ocean and Atmosphere (Jun 27-29) |
| 426 | ECM and ECCM for Digital Communications (Jul 11-15) |

†Saturday classes

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

CONTINUING ENGINEERING EDUCATION PROGRAM

COURSE NO. 355

PATENT LAW

for

Engineers and Scientists

June 16-18, 1977

COURSE NO. 434

ANTITRUST LAW

for

Engineers and Managers

June 20-22, 1977



THE
GEORGE WASHINGTON
UNIVERSITY

WASHINGTON, D.C. 20052
(202) 676-6106
(800) 424-9773

Course No. 355
PATENT LAW
for
Engineers and Scientists

DESCRIPTION

Patent law is generally considered difficult to understand by those who are not patent attorneys. As a result, potentially valuable legal rights may be lost by the promising inventor either because of reluctance to seek the services of a patent attorney or because of inability to communicate effectively with a patent attorney.

This course should be profitable to inventors, engineers, scientists, and managers in government, industry, and educational institutions who are interested in the nature and extent of patent rights, how they are acquired, and how they may and may not be used. The fundamental principles of patent law will be comprehensively covered as will the step-by-step procedure by which a patent application is produced and presented before the U.S. Patent and Trademark Office. The relationship between patents and trade secrets, copyrights, and trademarks will also be discussed. Limitations placed upon the exploitation of patent rights by the antitrust, tax, and food and drug laws will be considered. Instruction will include pitfalls in obtaining and maintaining patent rights, popularly held misconceptions about the patent system, significant court cases, and exercises in drafting and analyzing patent claims. While the course is not designed to prepare those attending for the Patent Agent's Examination, it will provide an introduction to patent law and an understanding of how to convert ideas into patent claims.

TOPICS

- What a patent is; relationship to trade secrets, copyrights, and trademarks
- Patent claims
- Statutory and nonstatutory subject matter
- Novelty, utility
- Nonobvious subject matter
- Priority of invention (interference practice)
- Inventorship entity, employee rights, government interest in patents
- Preparation of patent applications
- Prosecution of patent applications
- Licensing and assignment
- Litigation and international and foreign patent law

TEXT

Patent Law Fundamentals by Peter D. Rosenberg (Clark Boardman Co., Ltd.), which has been cited as

authority by United States Courts of Appeals: *Pfizer, Inc. v. International Rectifier Corp.* 538 F.2d 180, 188, 193, 190 U.S.P.Q. 273, 280, 284 (8th Cir., June 16, 1976); *Moraine Products v. ICI America, Inc.* 538 F.2d 134, 143, 191 U.S.P.Q. 65, 73 (7th Cir., June 18, 1976); and by the United States District Court for the district of Delaware: *Clopay Corp. v. Blessings Corp.*, _____ F. Supp. _____, _____, 191 U.S.P.Q. 751, 755, 759 (D.Del., Oct. 21, 1976).

Course No. 434
ANTITRUST LAW
for
Engineers and Managers

DESCRIPTION

Antitrust law plays a vital role in the American economy. Most business decisions of any magnitude cannot be made without giving consideration to possible antitrust consequences, since conduct which seems innocuous to the layman might have serious antitrust implications. Moreover, much of antitrust law exists in the form of complex court decisions which are not readily accessible to non-lawyers.

The objective of this course is to instruct administrators and engineers in managerial positions in both government and industry, through an integrated series of lectures on the scope and standards of antitrust laws. The lectures will present those cases which are leading precedents on the topics listed below.

TOPICAL OUTLINE

- Overview of trade regulation law; definitions; historical and economic background; exemptions
- Sherman Act, Sec. I (general principles)
- Trade associations; refusals to deal
- Sherman Act, Sec. II (monopolization, attempts to monopolize, etc.)
- Exclusive arrangements
- Mergers, joint ventures
- Antitrust aspects of patents, trademarks, and copyrights
- Robinson-Patman Act
- Procedure; enforcement by Justice Department and FTC
- Extraterritorial reach of U.S. antitrust laws; foreign antitrust laws
- Antitrust in regulated industries

TEXT

An Antitrust Primer by Earl W. Kintner (Macmillan Co.)

INSTRUCTOR

Peter D. Rosenberg received his Master of Laws in Patent and Trade Regulation Law at George Washington University. He is a member of the New York Bar, the American Bar Association, and the International Trade Committee of the Section on Antitrust Law of the American Bar Association.

FEE

The fee for course No. 355, Patent Law, is \$385; the fee for course No. 434, Antitrust Law, is \$380. Fee for attendance at both courses is \$650. This includes lecture notes, text, supplies, and parking. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Participants may delay payment until arrival.

HOUSING AND MEALS

Housing and meals are not provided. However, there is a wide variety of hotels, motels, and restaurants nearby. Information on available accommodations will be sent if requested.

LOCATION AND HOURS

Orientation will take place at 8:15 a.m. the first day of each course in room 642 of the GWU Library, 2130 H St., N.W. (corner of H and 22nd), Washington, D.C. Classes will be held from 8:30 a.m. to 4:15 p.m. daily, Thursday through Saturday and Monday through Wednesday.

CERTIFICATE

Students who attend the full course will be awarded a Certificate of Completion.

CONTINUING EDUCATION UNITS (CEU)

Continuing Education Units (1.8) will be awarded for the satisfactory completion of each course. The CEU is a uniform unit of measurement for recording noncredit learning in qualified continuing education programs. It provides a standardized means for business, industry, and government to measure in-service education. A permanent transferable record is maintained.

APPLICATIONS

Tentative or final application should be made as soon as practicable. Apply by letter, telephone, or purchase order to Continuing Engineering Education

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

CONTINUING ENGINEERING EDUCATION PROGRAM

MICROCOMPUTER INTERFACING WORKSHOP

July 6-8, 1977

ROUTE TO:



THE
GEORGE WASHINGTON
UNIVERSITY

WASHINGTON, D.C. 20052
(202) 676-6106 or (800) 424-9773

MICROCOMPUTER INTERFACING WORKSHOP 452
August 17-19, 1977

application form

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OTHER COURSES

(Dates subject to change)

No.

IN WASHINGTON, D.C.

- 260 Digital Integrated Circuits (May 23-27)
- 349 Design and Prediction of Sonar Systems (May 23-27)
- 382 Transmission Characteristics of Switched Telephone Networks (May 23-27)
- 424 Applications of Modular Micro Electronics and Microcomputers (May 31-Jun 3)
- 22 Working Statistics (Jun 1-3)
- 307 Digital Image Processing of Earth Observation Sensor Data (Jun 6-10)
- 252 Electromagnetic Compatibility (Jun 6-10)
- 360 Communication Systems Engineering (Jun 6-10)
- 374 Structured Programming (Jun 6-10)
- 247 Technology Trends in Communications (Jun 6-10)
- 151 Heat Pipe - Theory and Applications (Jun 7-10)
- 416 Integrated Energy Utility Systems (Jun 13-14)
- 428 Antennas (Jun 13-17)
- 355 Patent Law for Engineers and Scientists (Jun 16-18)
- 387 Microprocessors and Microcomputers (Jun 20-24)
- 418 Minicomputer Systems for Warehousing/Distribution Operations (Jun 22-24)
- 250† Electric Power System Design (Jun 25-Sep 24)
- 292 Modern Telecommunications (Jun 27-Jul 1)
- 302 Spread Spectrum Communications Systems (Jun 27-Jul 1)
- 356 Microwave Remote Sensing of Ocean and Atmosphere (Jun 27-29)
- 426 ECM and ECCM for Digital Communications (Jul 11-15)
- 261A/B Minicomputers (Jul 11-15)
- 390 Solar Heating and Cooling - Residential and Commercial Applications (Aug 8-12)
- 310 Microprocessors (Jul 20-22)

†Saturday class

CONTINUING ENGINEERING EDUCATION PROGRAM J.E. MANSFIELD, Director

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MICROCOMPUTER INTERFACING WORKSHOP

DESCRIPTION

This course is designed for those who are involved in implementing microcomputer solutions to real problems but who may have limited experience in actual computer interfacing. The course is equally divided between presentations and hands-on experimentation with a microcomputer to provide a practical approach to interfacing.

Presentations will include in-depth discussions of the 8080 microcomputer and software development aids such as editors, assemblers, and debugging programs. During the experimentation periods, integrated circuit "chips" and machine language programs are combined in experiments to reinforce the ideas and techniques presented in the lectures. Participants work in groups of two or three on the 8080 microcomputer provided, which uses a unique breadboarding concept to allow hardware and software experimentation. While the course concentrates on the 8080 microcomputer, now available from many manufacturers, the concepts are readily applied to almost any computer interfacing task, either on microcomputers or minicomputers.

Upon completion, participants should be able to interface any of the popular microcomputers such as those available from Intel, Pro-Log, Control Logic, MITS, E&L Instruments, and others.

There is no prerequisite for this course; however, some experience in digital electronics would be helpful.

OUTLINE

First Day

General Microcomputer Principles

- Data and Address Busses
- Control Signals
- Memory and Memory Types, R/W, ROM, and PROM
- Device Addressing
- Address Decoding
- Control of External Devices (on/off controls)
- Input and Output Data Flow—Software examples
- Device Select Pulses
- Device Addressing
- Device Decoding

Second Day

Introduction to 8080 Software

- Basic 8080 Instructions
- Data Transfer
- Math and Logical Instructions
- Branching or Transfer of Control
- Special Instructions
- Use of Subroutines and Stack Instructions
- Software/Hardware Examples
- Device Addressing (continued)
- Input and Output of Data
- Software Experiments

Third Day

Interrupts and Analog Interfacing

- Interrupts—how they work and pitfalls
- D/A and A/D Converters
- Software/Hardware Examples
- Input and Output (continued)
- Software Experiments (continued)
- Interrupts

INSTRUCTORS

Christopher A. Titus, Ph.D., is a microcomputer application engineer with Tychon, Incorporated, in Blacksburg, Va. He has co-authored a number of instrumentation articles and has had papers presented at major national engineering and science conferences.

Dr. Titus has programmed with the Intel 8008, Intel 8080, and the MOS Technology 6502 microcomputer. He has written editor, assembler, disassembler, and debug software as well as complete operating systems for microcomputers. He is also a proficient PDP-8 programmer and digital designer.

Jonathan A. Titus is president of Tychon, Incorporated, in Blacksburg, Va. Most of his current work involves application of microcomputers for data acquisition and control. He has written a number of articles on computers for both professional and popular publications.

Mr. Titus became interested in microcomputers in 1971 while working on a fast scan spectrometer system. His first microcomputer experience was with the Intel 8008, and his Mark-8 computer was featured as the first widely available hobbyist computer.

He has instructed digital electronic and microcomputer courses for the American Chemical Society.

TEXT

Introductory Experiments in 8080A Microcomputer Programming and Interfacing, by Larsen, Rony, and Titus

FEE

The fee for the course is \$385. This includes lecture notes, supplies, and parking. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Participants may delay payment until arrival.

HOUSING AND MEALS

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LOCATION AND HOURS

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CERTIFICATE

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APPLICATIONS

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SPECIAL COURSES

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE

CONTINUING ENGINEERING EDUCATION PROGRAM

MICROPROCESSORS AND MICROCOMPUTERS

THEORY AND APPLICATIONS

June 20-24, 1977

ROUTE TO:



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MICROPROCESSORS AND MICROCOMPUTERS

THEORY AND APPLICATIONS

No. 387
June 20-24, 1977

registration form

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- 394 Mathematical Theory of Reliability (Apr 16-20)
- 249 Electromagnetic Wave Propagation for Communications System Design (May 16-20)
- 445 Discrete Event Simulation (May 18-20)
- 448 Acquisition of Medical Devices for Non-federal Health Care Institutions (May 18-20)
- 415† Practical Digital Design (Jun 4-Jul 16)
- 444 Loan Guarantee Program for Financing Energy Conservation Opportunities in Existing Buildings (May 23-25)
- 260 Digital Integrated Circuits (May 23-27)
- 349 Design and Prediction of Sonar Systems (May 23-27)
- 382 Transmission Characteristics of Switched Telephone Networks (May 23-27)
- 22 Working Statistics (Jun 1-3)
- 406 Computer-aided Preliminary Ship Design (Aug 29-Sep 3)
- 307 Digital Image Processing of Earth Observation Sensor Data (Jun 6-10)
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- 360 Communication Systems Engineering (Jun 6-10)
- 374 Structured Programming (Jun 6-10)

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Course No. 387

MICROPROCESSORS and MICROCOMPUTERS Theory and Applications

DESCRIPTION

This course is designed to meet the needs of the computer systems engineer and the supervisory-level engineer involved in the use of microprocessors. The objective of this course is to provide the engineer working in the computer applications field with a better understanding of the concepts and applications of microprocessors and microcomputers by explaining how they are designed, how they operate, and how they compare to one another. The presentation should provide the hardware-oriented designer with a better working knowledge of the utilization of software techniques incident to the implementation of their design problems. Familiarity with software is not a prerequisite.

Applications to practical systems will be discussed.

There is no prerequisite for this course; however, experience in engineering or computer science would be helpful.

TOPICAL OUTLINE

First Day

• MICROCOMPUTER FUNDAMENTALS

System Elements — ROMs, RAMs, PLAs, ALUs, etc.
Microprocessor Structures
Instruction Sets
I/O Operations, DMA, and Interrupt Systems

Second Day

• SMALL MICROPROCESSORS

MC6800 — Detailed analysis and configuration
Comparative review of 8-bit microprocessors

Third Day

• BIT SLICE MICROPROCESSORS

Basic Processor Chips
Microprogrammed Sequencers
Hardware Support — Memory Chips, Multiplexors, Latches, Register Structures
Design of Larger Microcomputers

Fourth Day

• LARGE MICROCOMPUTERS AND SYSTEM DEVELOPMENT

Large Microprocessors — LSI-11, TI990
System Development
Hardware Prototyping Kits
In-Circuit Emulation

Fifth Day

• SOFTWARE SYSTEMS

Programming Languages
Resident Monitors
Operating Systems
Applications
Demonstrations

INSTRUCTORS

John H. Carson is a computer scientist with RLG Associates, Inc., Reston, Va. His present work involves mini- and micro-computer system design. His past experience has been with the MITRE Corporation, Bell Telephone Laboratories, and Lehigh University in connection with the research and development of special mini- and micro-computer systems. He holds a Ph.D. from Lehigh University in Information Science. Dr. Carson has lectured throughout the United States on mini- and micro-computers.

Abd-elfattah M. Abd-alla, Ph.D., is Associate Professor of Engineering and Applied Science at George Washington University. He is the author of a number of publications on computer operations and design, and is the co-author, with Arnold C. Meltzer, of *Principles of Digital Computer Design*, Vol. I. (Vol. II is in preparation.)

FEE

The fee for the course is \$465. This includes lecture notes and supplies. Make checks and purchase orders payable to GWU, Continuing Engineering Education. Free parking is provided. Participants may delay payment until arrival.

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SPECIAL COURSES

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OTHER COURSES

(Dates subject to change)

No.

IN WASHINGTON, D.C.

- 224 Design-to-Cost (May 2-4)
- 446 Applied Statistical Theory (May 2-6)
- 322 Computer Security (May 4-6)
- 420 Life Cycle Costing (May 4-6)
- 397 Fibrous Composite Structures (May 9-12)
- 287 Environmental Law (May 9-13)
- 395 Digital Signal Processing (May 9-13)
- 336 Advances in Electronics Technology (May 9-13)
- 414 Total Energy and Selective Energy Utility Systems (May 16-17)
- 203 Radar Systems and Technology (May 16-20)